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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Paper No. 28

Application Number: 09/318,159
Filing Date: 05/25/99
Appellant(s): Howard E. Rhodes

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GROUP 2800

Thomas J. D'Amico
For Appellant

EXAMINER'S ANSWER

This is in response to appellant's brief on appeal filed March 6, 2002.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the Brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the Brief.

(3) Status of Claims

The statement of the status of the claims contained in the Brief is incorrect. A correct statement of the status of the claims is as follows:

This appeal involves claims 45, 46, 49-52, 54-57, 59, 60 and 68-76.

Claims 1-44, 47, 48, 53, 58 and 61-67 have been canceled.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the Brief is correct.

(5) Summary of Invention

The summary of invention contained in the Brief is correct.

(6) Issues

The appellant's statement of the issues in the Brief is substantially correct. The changes are as follows: to simplify the issues, the rejection under 35 U.S.C. 112 and the rejections under 35 U.S.C. 102, based on Narita, Doo, Mastroianni et al, Kohara et al and Custode et al, are withdrawn. All claims still stand rejected

(7) Grouping of Claims

The appellant's statement in the Brief that certain claims do not stand or fall together is not agreed with because the Brief does not explain why claims 45, 46, 69-72, 75 and 76 are separately patentable. Hence, claims 45, 46 and 69-72 stand or fall together with claim 68; claims 75 and 76 stand or fall together with claim 73.

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the Brief is correct.

(9) Prior Art of Record

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

Schuegraf et al	5,702,976	12/1997
Jeng et al	5,492,853	2/1996
Jeng	5,706,164	1/1998
Kooi	3,755,001	8/1973
Joo et al	5,841,163	11/1998

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

The process terminology (claims 68, 73) is considered only in terms of a necessary *resultant structure* from the process. The process itself is not at issue. The device claims are *not* limited to the recited process. See MPEP 2113; *In re Brown*, 173 USPQ 685 (CCPA 1972); *In re Fitzgerald*, 205 USPQ 594 (CCPA 1980); *In re Marosi*, 218 USPQ 289, 292-293 (CCPA 1983); *In re Thorpe*, 227 USPQ 964 (CAFC 1985). In terms of *resultant structure*, the "ion implanted" region is taken as a region of N or P conductivity type. The "first" and "second" areas filled with "dielectric material" are taken as subportions of a *resultant* dielectric material, which may be the same dielectric material (claims 71, 75) in both subportions.

Claims 45, 46, 49-52, 54-57, 59, 60, 68-70, 72-74 and 76 stand rejected under 35 U.S.C. 103 as unpatentable over Schuegraf et al and Jeng et al '853 considered together. Impurity dopants in a substrate are conventional, as appellant would agree and as shown by Jeng et al (column 3, line 61, P- substrate), which would have been obvious to use for substrate 10 of Schuegraf et al (Figure 3D). The claims remain broad in scope. The "first" area and dielectric material reads on dielectric film 24; the "second" area and dielectric material reads on dielectric material 26, which are different (claims 72, 76). The "ions" read on inherent subportions of a doped substrate (e.g., P type) below trench dielectric 26. The claimed "ions" (e.g., P type) do not distinguish over other "ions" (e.g., P type) in a doped substrate 10. Note claims 49 & 57. An "active" region reads on a surface region adjacent a trench 22 which is "displaced away from" an inherent "ion implanted" P type doped region below trench dielectric 26 (claims 70, 73). An inherent "ion implanted" P type doped region can be chosen at an arbitrary depth to comply with claims 51, 52, 59, 60. The "memory" device (claims 46, 73) reads on a typical DRAM application taught by Schuegraf et al (column 4).

The impurity concentration of an inherent "ion implanted" P type region establishes a "field threshold voltage" (claims 50, 54) as noted by Schuegraf et al (column 4, lines 32-36, "field threshold voltage is influenced by a number of physical and material properties of the trench isolator such as . . . substrate doping, field implant dose"). The "first" dielectric material 24 is "on a bottom" of an "isolation" trench 22 (claims 69, 74). An "ion implanted" P type region below trench dielectric 26 is "displaced" from a surface "active" region adjacent to the trench 22

by at least a fraction of the depth of the trench (column 4, lines 23-26, 200 nm equals 2000 angstroms), which fraction would equal at least 100 angstroms (claim 45).

The width of a isolation trench is approximately 250 nm (column 4, lines 23-26), the thickness of "first" area dielectric 24 is at least 5 nm (column 5, lines 12-15), so that the "first" area on both sides of trench 22 would be 10/250, which is less than 40 percent, of the width of the isolation trench (claim 55). At least "about" 100 angstroms (claim 56) is taken to encompass at least 50 angstroms. Alternatively, it would have been obvious to chose a thickness of dielectric material 24 comparable and consistent to at least 50 angstroms (5 nm) suggested by Schuegraf et al.

Claims 45, 46, 49-52, 54-57, 59, 60, 68-71 and 73-75 stand rejected under 35 U.S.C. 102 as unpatentable as shown by Jeng '164. See Figures 2, 6, 12. The "first" and "second" areas and dielectric materials read on inherent subportions of dielectric layer 7 (claims 71, 75) in trench 6; the "ions" read on inherent subportions of P type substrate 1 below dielectric layer 7 (claims 49, 57). The claims remain broad in scope. In Jeng, an inherent "ion implanted" P region below dielectric layer 7 is "displaced away from" an "active" region comprising regions 12. Note that dielectric layer 7 is wider than sidewall spacer 11, which is wider than 500 angstroms (column 4, lines 20-26). The inherent oxide subportion for the "first" area can be chosen to an arbitrary thickness to comply with claims 55, 56, 70 and 73. An inherent "ion implanted" P type region below dielectric layer 7 can be chosen at an arbitrary depth to comply with claims 51, 52, 59 and 60. Jeng shows a "memory device" (claims 46, 73).

Clearly dielectric material is on the bottom of "isolation" trench 6 (claims 69, 74). An inherent "ion implanted" P region below dielectric layer 7 is "displaced away from" an "active" region 12 by at least 100 angstroms, which is a small fraction of the depth of about 3000 to 5000 angstroms of trench 6 (column 3, lines 44-46) (claim 45). The "field threshold voltage" (claims 50, 54) is inherently influenced by the doping concentration of substrate 1 below dielectric layer 7.

Claims 45, 49-52 and 68-71 stand rejected under 35 U.S.C. 102 as unpatentable as shown by Kooi et al. See Figures 1, 2, 8-10, 12, 17-22; column 7, line 11, to column 8, line 3, column 9, line 12, to column 10, line 47. The "first" and "second" areas and dielectric materials read on inherent subportions of oxide 5 or oxide 29 (claim 71); the "ion implanted" region reads on zone 6 or zone 28, "displaced away" from "active" regions 3 or 22. In claim 68, the "isolation trench" does not distinguish over oxide 5 or oxide 29, which extend below a surface of semiconductor substrate 1 or 21.

Alternatively, the "first" area filled with "first" dielectric material reads on oxide layer 56 (Figure 21); the "second" area filled with "second" dielectric material reads on the rest of oxide 43 (Figures 17, 22). The "ion implanted" region reads on zone 44 which is "displaced away" from "active" region 45 by at least the thickness of "first" area oxide layer 56 (claims 45, 70).

Claim 49 is disclosed by zone 6 and substrate 1 (Figure 2), by zone 28 and substrate 21 (Figure 10), and by zone 44 and substrate 41 (Figure 17). Claims 51 and 52 are disclosed by the

depth of zone 6 being a fraction (30 percent) of the depth of groove 4 (column 7), and by the depth of zone 28 being a fraction (60 percent) of the depth of the recess (column 8). See present specification, page 8, lines 25-30, for the interpretation of claims 51 and 52. Claim 69 is disclosed by oxide being on the bottom of groove 4 (Figure 2) and on the bottom of the recess (Figure 10). The "field threshold voltage" (claim 50) is inherently influenced by the doping concentration of zone 6 or zone 28. See column 6, lines 16-25.

Claims 46, 49-52, 54, 55, 57, 59, 60, 68-71 and 73-75 stand rejected under 35 U.S.C. 102 as unpatentable as shown by Joo et al. See Figure 15. The "first" and "second" areas and dielectric materials read on inherent subportions of field oxide layer 65 (claims 71, 75); the "ion implanted" region comprises layer 68, which is "displaced away from" an "active" region AA. The inherent subportion for the "first" area can be chosen to have an arbitrary thickness to comply with claim 55. Joo et al show a "memory" device in "active" region AA (Claims 46, 73).

Claims 50 and 54 are disclosed by layer 68 being a channel stop. A channel stop has the same conductivity type as the substrate (claims 49, 57), but a higher dopant concentration. The depth of region 68 appears between 20 to 80 percent of the depth of the recess with oxide layer 65 (claims 51, 52, 59, 60). The inherent "first" area subportion of field oxide 64 can be chosen to an arbitrary thickness to comply with claims 55, 70 and 73. Claims 69 and 74 are disclosed by an inherent subportion of oxide layer 65 being on the bottom of the recess ("isolation" trench).

(11) Response to Argument

Contrary to the Brief (pages 8-12), claims 68 and 73 remain broad in scope. In terms of necessary resultant structure, an "ion implanted" P type region simply does not distinguish over a P type region or an inherent P type subregion in a substrate, absent claiming how the "ion implanted" P type region differs in structure from another subregion in a P type substrate, e.g., differs in impurity concentration. A "first" area and "second" area filled with the same dielectric material do not distinguish over two inherent subportions of the same dielectric material. Note that Virginia may be viewed as comprised of counties or other "areas", e.g., Northern Virginia and Tidewater. A "first area" of dielectric material in claim 68 is not limited to region 24 in the disclosed invention, just as a "first area" of Virginia is not limited to Arlington county.

The conclusion that the claimed invention as a whole would have been obvious at the time the invention was made to a person of ordinary skill in the art is based on whether the hypothetical person of ordinary skill in the art, familiar with all that Schuegraf et al and Jeng et al disclose, "would have found it obvious to make a structure corresponding to *what is claimed.*" *In re Sovish*, 226 USPQ 771, 774 (Fed. Cir. 1985). "Applicant's difficulty lies in the breadth of the claims." *Sovish*, 226 USPQ at 774.

Contrary to the Brief (page 10), Schuegraf et al (Figure 3D) do show a region of substrate 10 below trench dielectric 26. The "ion implanted" region does not distinguish in resultant structure over a subregion of substrate 10 of Schuegraf et al. For example, appellant could have but did not claim a different impurity concentration for the "ion implanted" region. "Appellant's

difficulty lies in the breadth of the claims." *Sovish*, 226 USPQ at 774. As claimed, an "active" region reads on a surface region adjacent isolation trench 22 which would have a device (columns 1-2) which includes a DRAM ("memory") device (column 4).

Contrary to the Brief (page 11), it would have been obvious that the substrate 10 of Schuegraf et al have a conductivity type, e.g., P type, which would include an inherent subportion below dielectric 26 that does establish a "field threshold voltage" (see column 4, lines 32-36). Contrary to the Brief (page 11), dielectric film 24 is "on a bottom" of "isolation trench" 22 of Schuegraf et al (Figure 3D), as in claims 69 and 74. Contrary to the Brief (page 12), an inherent P type region below dielectric 26 can be chosen at an arbitrary depth to comply with claims 51, 52, 55 and 56. "Appellant's difficulty lies in the breadth of the claims." *Sovish*, 226 USPQ at 774. The "sidewall thickness" (claims 55, 56, 70, 73) is disclosed or would have been suggested by the thickness of dielectric film 24 on the sidewall of "isolation" trench 22 of Schuegraf et al.

Contrary to the Brief (page 13), dielectric layer 7 of Jeng does have inherent subportions, and P type substrate 1 does have an inherent subportion below dielectric layer 7. The "first" and "second" areas do not distinguish over inherent subportions of dielectric layer 7; the "ion implanted" region as *resultant structure* does not distinguish over an inherent subportion of P type substrate 1 below dielectric layer 7. Contrary to the Brief, trench 6 with dielectric layer 7 is clearly as much an "isolation trench" as the trench in this invention. The oxide 24 and 34 of this invention (Figure 8) correspond to oxide layer 7 of Jeng. Contrary to the Brief (pages 13-14), an "ion implanted" region as *resultant structure* encompasses a P type region, which Jeng shows

as an inherent subportion of P type substrate 1 below dielectric layer 7 (claims 49, 50, 54, 57). "Appellant's difficulty lies in the breadth of the claims." *Sovish*, 226 USPQ at 774.

Contrary to the Brief (page 15), claims 69 and 74 are disclosed by dielectric material 7 being on the bottom of trench 6. An inherent "ion implanted" P region below dielectric layer 7 can be chosen to comply with claims 51, 52, 59, 60. Contrary to the Brief, some inherent P type subregion below dielectric layer 7 is "displaced away" from an "active" region 12 by a "distance at least equal to" some "sidewall thickness" of dielectric layer 7 in "isolation" trench 6. Also the inherent oxide subportion for the "first" area can be chosen to an arbitrary thickness to comply with claims 55, 56, 70, 73, because both the "first" area and "second" area are filled with the same dielectric (claims 71, 75) as dielectric layer 7 of Jeng.

Contrary to the Brief (pages 18-19), the groove 4 (Figures 2, 8), the recess (Figure 10) and the groove 55 (Figures 17, 21) of Kooi et al are all isolation trenches as much as the trench in this invention. Contrary to the Brief, the "ion implanted" region reads on zone 6 (Figures 2, 8), zone 28 (Figure 10) and zone 44 (Figures 17, 21), which have the same conductivity type as the substrate (claim 49). Contrary to the Brief, Kooi et al (Figures 7, 12) disclose ion implantation. Contrary to the Brief, zone 6 (Figure 2) is "displaced away" from "active" region 3, zone 28 (Figure 10) is "displaced away" from "active" region 22, and zone 44 (Figure 17) is "displaced away" from "active" region 45. Contrary to the Brief, the "field threshold voltage" (claim 50) is inherently influenced by the doping concentration of zone 6 or zone 28. See column 6, lines 16-25.

In Figures 2, 8, oxide 5 could fill groove 4. See column 7, last line, to column 8, line 3. Oxide 24, 34 together in Figure 8 of this invention corresponds to oxide 5 (Figure 2), oxide 29 (Figure 10) and oxide 43 (Figure 17) of Kooi et al. Contrary to the Brief, in claims 68 and 71, the "first" and "second" areas do not distinguish over inherent subportions of oxides 5, 29 and 43 of Kooi et al. Contrary to the Brief (page 19), claims 51 and 52 are disclosed by the depth of zone 6 being a fraction (column 7, 1.5/5 equals 30 percent) of the depth of groove 4, and by the depth of zone 28 being a fraction (column 8, 1.2/2 equals 60 percent) of the depth of the recess. See present specification, page 8, lines 25-30, for the interpretation of claims 51 and 52. "Appellant's difficulty lies in the breadth of the claims." *Sovish*, 226 USPQ at 774.

Contrary to the Brief (page 24), field oxide layer 65 within field area FA in substrate 51 of Joo et al (Figure 15) does constitute an "isolation" trench within a "field isolation region" as claimed. The "first" and "second" areas with the same dielectric material, as in claims 68, 71, 73 and 75, do not distinguish over inherent subportion areas within field oxide layer 65. In Figure 8 in this application, oxide 24, 34 together constitute an oxide layer which corresponds insofar as claimed to field oxide layer 65 of Joo et al. Contrary to the Brief, claims 50 and 54 are disclosed by layer 68 of Joo et al being a channel stop. See column 1, lines 47-49. A channel stop 68 has the same conductivity type as the substrate 51 (Claims 49, 57), but a higher dopant concentration, as appellant would agree.

Contrary to the Brief (page 25), claims 69 and 74 are disclosed by an inherent subportion of oxide layer 65 being "on a bottom" of the recess ("isolation" trench). Contrary to the Brief,

Joo et al (Figure 15) clearly show "ion implanted" P type region 68 "displaced away" from "active" region AA by at least a "sidewall thickness" of oxide layer 65 (Claims 70, 73). An inherent subportion for the "first" area of oxide layer 65 can be chosen to have an arbitrary thickness to comply with claim 55. Contrary to the Brief, the depth of region 68 appears between 20 to 80 percent of the depth of the recess with oxide layer 65 (claims 51, 52, 59, 60). Contrary to the Brief (page 25), claim 56 is not rejected based on Joo et al.

"Appellant's difficulty lies in the breadth of the claims." *Sovish*, 226 USPQ at 774. It is submitted that the claims are properly rejected as unpatentable, as explained above.

Respectfully submitted,

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